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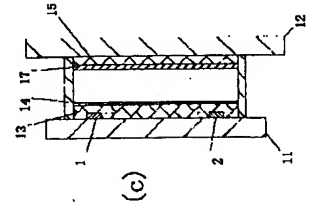
(54)【発明の名称】　放電形成デバイス、放電発光デバイス、プラズマディスプレイパネル、並びにそれらを用いた照明装置及びディスプレイ装置

(57)【要約】
【課題】　高輝度、高発光効率であり、安定な放電が可能な、放電発光デバイス、プラズマディスプレイパネル及びそのディスプレイ装置を提供すること。
【解決手段】　第１電極１の形状により放電を集中させ、放電電流を抑制するタイミングで電圧を減少させることを特徴とする放電発光デバイス、プラズマディスプレイパネル及びそのディスプレイ装置。



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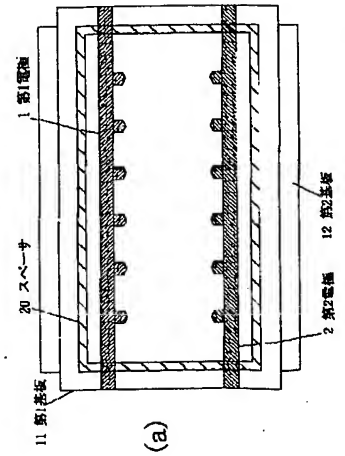

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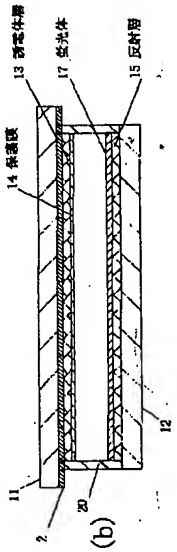

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PATENT ABSTRACTS OF JAPAN

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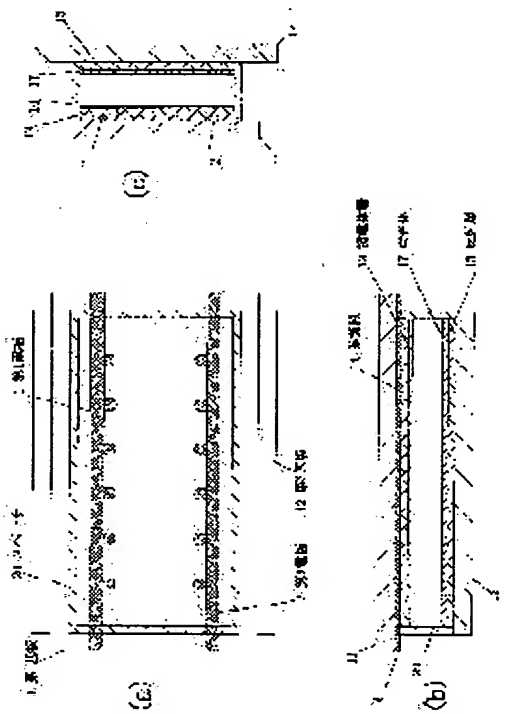
(72)Inventor : KATO TETSUYA

(54) DISCHARGE FORMATION DEVICE, DISCHARGE LUMINOUS DEVICE, PLASMA DISPLAY PANEL AND ILLUMINATION DEVICE AND DISPLAY DEVICE USING THESE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a discharge luminous device and a plasma display panel and its display device that have a high luminous efficiency and are capable of giving stable discharge.
SOLUTION: In the discharge luminous device and the plasma display panel and its display device, discharge is made to be concentrated by the configuration of the first electrode 1, and the voltage is reduced at the timing when the discharge current is to be suppressed.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] A discharge formation device which has a means on which gas discharge is centralized, and a means to control the discharge current resulting from said gas discharge.
[Claim 2] An electroluminescence device which has a means on which gas discharge is centralized, and a means to control the discharge current resulting from said gas discharge.
[Claim 3] An electroluminescence device according to claim 2 with which a means on which it is formed in when gas discharge impresses voltage to inter-electrode, and gas discharge is centralized with a configuration of said electrode is realized.
[Claim 4] An electroluminescence device according to claim 2 with which a means on which gas discharge is centralized is realized with a configuration of a dielectric film which was formed when gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[Claim 5] 4 is [claim 2 by which a means to control the discharge current is realized thru/or] the electroluminescence device of a publication either by being formed when gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[Claim 6] 4 is [claim 2 characterized by realizing a means to control the discharge current thru/or] the electroluminescence device of a publication either by being formed when gas discharge impresses voltage to inter-electrode, and decreasing said voltage to timing which makes the discharge current control.
[Claim 7] 6 is [claim 2 by which two or more formation of the discharge concentrated with a means on which gas discharge is centralized is carried out thru/or] the electroluminescence device of a publication either.
[Claim 8] An electroluminescence device according to claim 7 with which discharge which plurality concentrated is divided by septum.
[Claim 9] 8 is [claim 2 which has a means to emit light by discharge concentrated with a means on which gas discharge is centralized, and to diffuse the luminescence thru/or] the electroluminescence device of a publication either.
[Claim 10] 9 is [claim 2 thru/or] the lighting system constituted so that the illuminated body might be illuminated using an electroluminescence device of a publication either.
[Claim 11] 9 is [claim 2 thru/or] a display unit using an electroluminescence device of a publication, or a lighting system according to claim 10 either.
[Claim 12] A plasma display panel which is a plasma display panel with possible making it display by controlling luminescence by gas discharge for every pixel, and has a means on which discharge is centralized, and a means to control the discharge current resulting from said discharge.
[Claim 13] A plasma display panel according to claim 12 with which a means on which it is formed in when gas discharge impresses voltage to inter-electrode, and discharge is centralized with a configuration of said electrode is realized.
[Claim 14] A plasma display panel according to claim 12 characterized by realizing a means on which discharge is centralized with a configuration of a dielectric film which was formed when gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[Claim 15] 14 is [claim 12 by which a means to control the discharge current is realized thru/or] the plasma display panel of a publication either by being formed when gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[Claim 16] 14 is [claim 12 by which a means to control the discharge current is realized thru/or] the plasma display panel of a publication either by being formed when gas discharge impresses voltage to inter-electrode, and decreasing said voltage to timing which makes the discharge current control.
[Claim 17] 16 is [claim 12 thru/or] a display unit using a plasma display panel of a publication either.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the lighting system and display unit which used them for the discharge formation device by gas discharge, the electroluminescence device, the plasma display panel, and the list.
[0002]
[Description of the Prior Art] The liquid crystal panel is widely used for various kinds of displays, such as a personal computer monitor and television, from the reasons of that a thin shape is possible, a lightweight thing, being a low power. However, since the liquid crystal itself is not a spontaneous light corpuscle child, it needs the back light which supplies light from the back of a liquid crystal panel for a display. Although the edge light method which installed the capillary cold cathode fluorescent lamp in the edge of a light guide plate is generally used as this back light, the direct lower part type by the flat-surface mold discharge lamp is also used.
[0003] The conceptual diagram of a typical flat-surface mold discharge lamp is shown in drawing 16 . This drawing (a) shows a plan and this drawing (b) and (c) show a cross section. Discharge space consists of two glass substrates and a spacer, two electrodes covered with the dielectric are formed in the glass front inside, and the fluorescent substance is applied to the back glass inside. Mercury and rare gas are enclosed and discharge space generates ultraviolet rays by the discharge in gases, excites a fluorescent substance and is making it emit light by these ultraviolet rays.
[0004] The method of driving a flat-surface mold discharge lamp will obtain luminescence which spreads uniformly in the whole discharge space by impressing a rectangular voltage waveform to two electrodes of a front board by turns, and choosing the period of a square wave, and pulse width suitably.
[0005] However, a problem is in the conventional flat-surface mold discharge lamp still having low luminous efficiency, breakdown voltage being high and brightness being low. Moreover, it is also difficult to extend luminescence uniformly to the whole discharge space. It is considered to be the cause that this cannot use the positive column for stability.
[0006] Although various examination is made to the above-mentioned technical problem and JP,9-27298,A, JP,10-222083,A, JP,11-7916,A, JP,11-144678,A, etc. are raised as a patent until now, for example, sufficient result is not obtained even if it adopts said patent information.
[0007] On the other hand, since plasma display panels (PDP) are that a high-speed display is possible compared with a liquid crystal panel, and an angle of visibility is large, that enlargement is easy, and a spontaneous light type, they attract attention in flat-panel display technology from the reasons nil why display quality is high etc. especially recently.
[0008] Generally, by PDP, generate ultraviolet rays by the discharge in gases, and excite a fluorescent substance, it is made to emit light by these ultraviolet rays, and color display is performed. And the display cel divided by the septum is prepared on the substrate, and it has the configuration in which the fluorescent substance layer is formed in this. Especially the mainstream of PDP is the field discharge mold PDP of 3 electrode structures now, and the structure has the display electrode pair which adjoined parallel on one substrate, has the address electrode 23 prolonged in the direction which intersects a display electrode on another substrate, and a septum 16 and the fluorescent substance layer 17, and can thicken a fluorescent substance layer comparatively, and it can be said that it is suitable for the color display by the fluorescent substance. The partial decomposition perspective diagram (conceptual diagram) of the field discharge mold PDP of 3 typical electrode structures is shown in drawing 17 . The display electrode pair is making the couple with the scanning electrode (scan electrode) 21 and the sustain electrode (maintenance electrode) 22.
[0009] The method of driving the conventional panel performs a gradation display with the combination of the subfield which it divides subfield] into two or more subfields with the weight of the luminescence period based on a binary system for 1 field period, and makes them emit light. Each subfield consists of an initialization period, an address period, and a maintenance period. In order to display image data, a signal wave form which is different in an initialization period, an address period, and a maintenance period, respectively is impressed to each electrode. In an initialization period, an initialization pulse is impressed to all the scanning electrodes 21. In an address period, by writing in between the address electrode 23 and the scanning electrode 21, and impressing a pulse, address discharge is performed between the address electrode 23 and the scanning electrode 21, and a discharge cel is chosen. In the continuing maintenance period, it displays by performing maintenance discharge between the scanning electrode 21 and the sustain electrode 22 by impressing periodic maintenance BARUSU reversed by turns between a fixed period, the scanning electrode 21, and the sustain electrode 22.
[0010] However, a problem is in conventional plasma display equipment still having low luminous efficiency, and brightness being low. For example, luminous efficiency is about [of 1 lm/W and CRT] 1/5.
[0011] Until now, although various examination is made to the above-mentioned technical problem, in order to gather the luminous efficiency of ultraviolet rays, there is no example by which PDP using a positive column was put in practical use. It is considered to be raised by not stabilizing discharge that this has a limit in the magnitude of the cel of PDP to an inter-electrode distance required for a positive column, and only by enlarging inter-electrode distance simply that control of discharge is difficult etc.
[0012] As a patent, although JP,5-41165,A, JP,5-41164,A, JP,6-275202,A, etc. are raised, for example, even if it adopts said patent information, sufficient result is not obtained.
[0013]
[Problem(s) to be Solved by the Invention] as mentioned above, the conventional flat-surface mold discharge lamp -- luminous efficiency -- it was low, breakdown voltage was high, and the technical problem that brightness was low occurred.
[0014] The first object of this invention can use solving the above-mentioned problem, i.e., a positive column, for stability, and is to offer the

lighting system and display unit which used them for the electroluminescence devices which realize high brightness and high luminous efficiency and those actuation methods, and a list.
[0015] On the other hand, conventional plasma display equipment had the technical problem that luminous efficiency was remarkable and it was low as compared with displays, such as CRT, as mentioned above. If inter-electrode distance which generally causes discharge is lengthened, a positive column can be generated, but with the cel configuration of PDP, only by merely lengthening inter-electrode distance, a positive column is not stabilized and discharge does not become so large [a flicker and luminous efficiency].
[0016] The second object of this invention can use solving the above-mentioned problem, i.e., a positive column, for stability, and is to offer the actuation method of a plasma display panel of realizing high brightness and high luminous efficiency, and the display unit using it.
[0017]
[Means for Solving the Problem] A lighting system and a display unit which used them for a discharge formation device by this invention, an electroluminescence device, plasma display panels and those actuation methods, and a list are characterized by having a means on which discharge is centralized, and a means to control the discharge current resulting from said discharge.
[0018] It had become [how discharge is extended from that uniform discharge will not be obtained once it has the property which is easy to concentrate when especially gas discharge generally uses rare gas and discharge concentrates, effectiveness being quite large and falling, although the discharge current will flow too much once discharge concentrates further, and it becomes high brightness locally, etc., and efficient-ization is realized, and] with the point of development. Furthermore, although pulse width of applied voltage, timing, etc. are realized chiefly, generally these actuation margins of opening a positive column to the whole space are narrowly difficult to control. Since this inclination was so remarkable that it makes gas pressure high, it was difficult to use these gas pressure fields where effectiveness is high.
[0019] On the other hand, by daring centralize discharge, this invention realizes high brightness-ization and realizes efficient-ization simultaneously by controlling the discharge current which flows too much. Since a margin of actuation conditions can take greatly by this, it is easy to carry out control, and since a high field of gas pressure can be used, it becomes possible to raise effectiveness further.
[0020]
[Embodiment of the Invention] Invention of this invention according to claim 1 is a discharge formation device which has the means on which gas discharge is centralized, and a means to control the discharge current resulting from said gas discharge.
[0021] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such a discharge formation device.
[0022] Invention of this invention according to claim 2 is an electroluminescence device which has the means on which gas discharge is centralized, and a means to control the discharge current resulting from said gas discharge.
[0023] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such an electroluminescence device, and high brightness and high luminous efficiency can be realized.
[0024] Invention of this invention according to claim 3 is an electroluminescence device according to claim 2 with which the means on which it is formed in when gas discharge impresses voltage to inter-electrode, and gas discharge is centralized with the configuration of said electrode is realized.
[0025] Since line of electric force focuses on a projection and field strength becomes large by preparing a projection for example, in an electrode configuration with such an electroluminescence device, it becomes possible to centralize discharge easily.
[0026] Invention of this invention according to claim 4 is an electroluminescence device according to claim 2 with which the means on which gas discharge is centralized is realized with the configuration of the dielectric film which was formed when gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[0027] If the dielectric film by the material with a large secondary-electron-emission coefficient is formed for example, on an electrode and it is made for discharge to generate with such an electroluminescence device at some electrodes, it will become possible to centralize discharge as a result.
[0028] Invention of this invention according to claim 5 is claim 2 by which a means to control the discharge current is realized thru/or the electroluminescence device of any of 4, or a publication by being formed when gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[0029] Such an electroluminescence device enables it to control the discharge current which flows too much by back EMF of an inductance. Once discharge concentrates, since it is going to flow at a stretch, if back EMF can be generated in self-adapting with an inductance, since the discharge current can also control the fluctuation, it not only can control the discharge current, but it will serve as discharge very stable as a result.
[0030] Invention of this invention according to claim 6 is claim 2 characterized by realizing a means to control the discharge current thru/or the electroluminescence device of any of 4, or a publication by being formed when gas discharge impresses voltage to inter-electrode, and decreasing said voltage to the timing which makes the discharge current control.
[0031] Such an electroluminescence device enables it to control the discharge current which flows too much by impressing back EMF compulsorily.
[0032] Invention of this invention according to claim 7 is claim 2 by which two or more formation of the discharge concentrated with the means on which gas discharge is centralized is carried out thru/or the electroluminescence device of any of 6, or a publication.
[0033] It becomes possible to carry out two or more formation of the discharge localized by concentration two-dimensional, and to obtain luminescence of field discharge with such an electroluminescence device.
[0034] Invention of this invention according to claim 8 is an electroluminescence device according to claim 7 with which the discharge which plurality concentrated is divided by the septum.
[0035] It becomes possible to form a wall near the concentrated discharge and to make control of a positive column easy with such an electroluminescence device. This is because the generation condition of positive column discharge is greatly influenced with a wall. Furthermore, it becomes possible to obtain luminescence near the discharge by forming a fluorescent substance on a wall, and high brightness luminescence can be realized further.
[0036] Invention of this invention according to claim 9 is claim 2 which has a means to emit light by discharge concentrated with the means on which gas discharge is centralized, and to diffuse the luminescence thru/or the electroluminescence device of any of 8, or a publication.
[0037] Wide range luminescence is realizable by extending the discharge localized by concentration with such an electroluminescence device. Moreover, ** which makes homogeneity further field luminescence which was made to carry out two or more formation of the discharge localized by concentration two-dimensional, and was obtained becomes possible.

[0038] Invention of this invention according to claim 10 is the lighting system constituted using claim 2 thru/or the electroluminescence device of any of 9, or a publication so that the illuminated body might be illuminated.
[0039] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such a lighting system, and the back light of high brightness and high luminous efficiency can be realized.
[0040] Invention of this invention according to claim 11 is the display unit which used claim 2 thru/or the electroluminescence device of any of 9, or a publication, or the lighting system according to claim 10.
[0041] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such a display unit, and the display of high brightness and high luminous efficiency can be realized.
[0042] Invention of this invention according to claim 12 is a plasma display panel with possible making it display by controlling luminescence by gas discharge for every pixel, and is a plasma display panel which has the means on which discharge is centralized, and a means to control the discharge current resulting from said discharge.
[0043] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such a plasma display panel, and high brightness and high luminous efficiency can be realized.
[0044] Invention of this invention according to claim 13 is a plasma display panel according to claim 12 with which the means on which it is formed in when gas discharge impresses voltage to inter-electrode, and discharge is centralized with the configuration of said electrode is realized.
[0045] Since line of electric force focuses on a projection and field strength becomes large by preparing a projection for example, in an electrode configuration with such a plasma display panel, it becomes possible to centralize discharge easily.
[0046] Invention of this invention according to claim 14 is a plasma display panel according to claim 12 characterized by realizing the means on which discharge is centralized with the configuration of the dielectric film which was formed when gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[0047] If the dielectric film by the material with a large secondary-electron-emission coefficient is formed for example, on an electrode and it is made for discharge to generate with such a plasma display panel at some electrodes, it will become possible to centralize discharge as a result.
[0048] Invention of this invention according to claim 15 is claim 12 by which a means to control the discharge current is realized thru/or any of 14 or the plasma display panel of a publication by being formed when gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[0049] Such a plasma display panel enables it to control the discharge current which flows too much by back EMF of an inductance. Once discharge concentrates, since the discharge current tends to flow at a stretch, if discharge is controllable by the inductance in self-adapting, since it can also control the fluctuation, it not only can control the discharge current, but it will serve as discharge very stable as a result.
[0050] Invention of this invention according to claim 16 is claim 12 by which a means to control the discharge current is realized thru/or any of 14 or the plasma display panel of a publication by being formed when gas discharge impresses voltage to inter-electrode, and decreasing said voltage to the timing which makes the discharge current control.
[0051] Such an electroluminescence device enables it to control the discharge current which flows too much by impressing back EMF compulsorily.
[0052] Invention of this invention according to claim 17 is the display unit which used claim 12 thru/or any of 16 or the plasma display panel of a publication.
[0053] It becomes possible to be able to obtain very strong discharge because discharge concentrates, to exclude useless power by controlling the discharge current, and to obtain efficient discharge with such a display unit, and the display of high brightness and high luminous efficiency can be realized.
[0054] In addition, if the discharge formed compared with the case where it does not have by having in a claim "the means on which discharge is centralized" of a publication is increasing heterogeneity spatially, it will be understood as corresponding to what a publication "centralizes discharge for" on a claim.
[0055] Moreover, if the discharge current is decreasing compared with the case where it does not have by having in a claim "a means to make the discharge current control" of a publication, it will be understood as corresponding to what a publication "makes a claim control the discharge current."
[0056] Although the gestalt of operation explains this invention concretely below, the mode of operation of this invention is not limited to this.
[0057] (Gestalt 1 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0058] The discharge formation device explained with the gestalt of this operation is characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list.
[0059] The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list. Moreover, it is formed when said gas discharge impresses voltage to inter-electrode, and it is characterized by realizing the means on which the aforementioned discharge is centralized with the configuration of said electrode.
[0060] Moreover, it is characterized by realizing a means to control the aforementioned discharge current by being formed when said gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[0061] Moreover, it is characterized by carrying out two or more formation of the concentrated discharge by an aforementioned device or/and an aforementioned means.
[0062] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0063] The conceptual diagram of the electroluminescence device used for [device structure] drawing 1 with the gestalt 1 of this operation is shown. These drawings (a) are a plan and this drawing (b), and (c) is a cross section. The electroluminescence device of drawing 1 has two kinds of electrodes mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair, the 1st electrode 1, the 2nd electrode 2, the dielectric layer 13, the reflecting layer 16 that has a protective coat 14 and reflects the light on the inner surface of the 2nd substrate 12 of another side, and the fluorescent substance 17 which emits light by discharge. The inter-electrode distance of the 1st electrode 1 and the 2nd electrode 2 is 0.2mm or more which can form positive column discharge.

[0064] Although soda lime glass is common as construction material of a substrate, it is not limited especially. Although it is common to be formed with silver, or chromium / copper / chromium (laminated structure) as for an electrode, it is not limited especially. A fluorescent substance is excited by the ultraviolet rays generated in discharge, and especially if light is emitted, it will not be limited. Although it is common to use low melting glass as construction material of a dielectric, it is not limited especially. Although the high material of a protective coat is [the secondary-electron-emission coefficient gamma] desirable and MgO is common, it is not limited especially. Although mixed gas or Xe gas of discharge gas of a kind and Xe is common at least among helium, Ne, and Ar, it is not limited especially. Mercury may be used if needed. Moreover, the structure of a device does not necessarily need to be a flat surface and may be a capillary. Moreover, the electrode necessarily needs to be covered neither by the dielectric layer nor the protective coat. Moreover, the 1st electrode 1 and the 2nd electrode 2 do not necessarily need to be formed in the inner surface of the same substrate. Moreover, the gestalt of discharge does not necessarily need to be a positive column, therefore the inter-electrode distance of the 1st electrode 1 and the 2nd electrode 2 is arbitrary. However, luminous efficiency improves greatly by positive column discharge, and an effect is large [this invention] especially in case this invention uses positive column discharge.

[0065] Hereafter, the device for centralizing discharge is explained. With the gestalt of this operation, the configuration of an electrode has realized the device for centralizing discharge. The projection is formed in some electrodes, and in case voltage is impressed to inter-electrode, it consists of examples of drawing 1 so that line of electric force may focus and field strength may become large. The configuration for a height should just choose the optimal configuration from the balance of the degree of discharge concentration, and the degree of the below-mentioned discharge current control. If discharge can be centralized, it is not necessary to be necessarily a projection. For example, it is also possible by narrowing inter-electrode distance only in a field with an electrode to centralize discharge.

[0066] The device on which discharge is centralized here does not necessarily need to be formed in both the 1st electrode 1 and the 2nd electrode 2. For example, in a certain discharge field, a projection is prepared in the 1st electrode 1, and the shape of linear then and discharge concentrate the 2nd electrode 2 by the 1st electrode 1 side, and in this field, it becomes a triangular discharge configuration and becomes a radii configuration, then a sector discharge configuration about the 2nd electrode 2. Moreover, when forming two or more these, in a certain field, a projection may be prepared only in the 1st electrode 1, and a projection may be prepared only in the 2nd electrode 2 in another field. Moreover, two or more formation does not necessarily have to be carried out. Moreover, there may not be the need that the roles of two kinds of electrodes not necessarily differ, and may completely be equivalent.

[0067] That is, the polarity of the applied voltage of each electrode may be fixed and you may change by turns. Moreover, the electrode pair which these electrodes constitute is very good in the structure of a repeat like drawing 2 . If such repeat structure is adopted, luminescence area can be set up freely. It is the same also considering the electrode of the same kind which adjoins by drawing 2 as common one.

[0068] Next, a means to control the discharge current is explained. With the gestalt of this operation, the device or means for controlling the discharge current is realized by connecting an inductance at least to one side of an electrode at a serial. Under the present circumstances, if the effect which controls the discharge current is brought about, it is not necessary to not necessarily generate back EMF (for example, inductance).

[0069] These effects are explained using the example driven by the actuation method below. Next, the effect of forming two or more concentrated discharge with the above devices or/and means is explained. First, field electroluminescence can be obtained by forming two or more concentrated discharge two-dimensional. Furthermore, since it has local very strong luminescence reinforcement, even if it diffuses this and equalizes two-dimensional, the concentrated discharge is obtained by uniform discharge two-dimensional from the start, and serves as high brightness from luminescence.

[0070] Furthermore, since, as for uniform discharge forming two or more discharge concentrated on the whole field to current flowing two-dimensional, current flows locally, the amount of current will not necessarily become large, if it sees in the whole field. Therefore, high brightness and high luminous efficiency are realizable by optimizing.

[0071] Moreover, in case discharge concentrated, for example is made into the light source as a means to obtain uniform luminescence two-dimensional by concentrated discharge and this arrangement is designed, the field which is not the light source is easy to be if it is made arrangement from which luminescence uniform as a whole is obtained by piling up the leakage light of two or more surrounding light sources. Moreover, arrangement of a fluorescent substance may be devised so that luminescence may become uniform.

[0072] In addition, it is applicable only to two dimensions to form two or more concentrated discharge itself also at three dimensions.

[0073] The voltage waveform impressed to [actuation method] drawing 3 to the 1st electrode 1 and the 2nd electrode 2 at a conducting period is shown. This drawing (a) shows the voltage waveform impressed to the 1st electrode 1, and this drawing (b) shows the voltage waveform impressed to the 2nd electrode 2. Drawing 3 shows only the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi. This voltage waveform is an output wave from a circuit, and the voltage waveform actually built over an electrode changes with below-mentioned inductances.

[0074] Light is made to emit continuously in a conducting period by repeating the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi, and the period when the voltage of the 1st electrode 1 changes from Hi to Lo, and the voltage of the 2nd electrode 2 changes from Lo to Hi. However, if the electrode is not covered with a dielectric layer, it is not necessary to carry out repeat reversal of the applied voltage. Moreover, a voltage waveform does not necessarily need to be a square wave and a sine wave etc. is sufficient as it. Generally the one where the rate of rise of applied voltage is smaller is easy to concentrate discharge and is convenient. Moreover, voltage may be impressed so that one of the electrodes may always serve as Hi. In this case, it is desirable for a wall charge to be eliminated to some extent within 1 period by self-elimination discharge etc.

[0075] First, in the period which changes from Hi to Lo, the voltage of the 2nd electrode 2 decreases the potential difference between the 1st electrode 1 and the 2nd electrode 2, and is discharging the capacitor of a device. At this time, it is also possible to generate self-elimination discharge and it is also possible to generate the discharge which continues considering this as a trigger.

[0076] In the period which changes from Lo to Hi, the potential difference was produced between the 1st electrode 1 and the 2nd electrode 2, and the continuing voltage of the 1st electrode 1 just made the 2nd electrode 2 negative for the 1st electrode 1, and has charged the device.

[0077] Next, if the field strength between the 1st aforementioned electrode 1 and the 2nd electrode 2 exceeds a threshold, discharge will begin. Discharge can be made to start by part for this height by designing so that line of electric force may concentrate the projection of an electrode here and field strength may become strong. As a result, discharge will be concentrated on a part for a height, without spreading in the whole inter-electrode one.

[0078] If discharge begins, the discharge current will flow between the 1st electrode 1 and the 2nd electrode 2, a fluorescent substance is excited by the ultraviolet rays generated by discharge, and light is emitted. Although the discharge current begins to flow at a stretch at this time, back EMF occurs with the inductance connected at least to one side of an electrode at the serial, and the discharge current is controlled.

Under the present circumstances, if the effect which controls the discharge current is brought about, it is not necessary to not necessarily generate back EMF (for example, inductance). Moreover, you may connect to the timing which controls buildup of the discharge current, and an inductance may be connected beforehand. Moreover, what is necessary is just to choose an inductance in accordance with the capacity of a device so that the discharge current may be controlled suitably since the optimal magnitude changes with capacity of a device.
[0079] It turns out that the discharge current will become small if the discharge current is actually observed, and it becomes a gently-sloping current wave form. It not only controls the discharge current, but an inductance is for also controlling fluctuation of the discharge current in order to carry out back EMF generating in self-adapting by change of the discharge current. When a positive column is observed at this time, it turns out that it became very strong and is stable.
[0080] Thus, the brightness of 8000 cd/m2 and the luminous efficiency of 30 lm/W were able to be acquired, without using mercury by driving.
[0081] Next, the case where a part for a height is not prepared in an electrode is explained. When not preparing a part for a height in an electrode, discharge can be extended on the whole surface by choosing the optimal conditions. Although the optimal conditions can be found by investigating the conditions of the BARUSU width of face of applied voltage, or timing chiefly, as for this actuation margin, generally, what it is hard to control narrowly is actual. If optimization is not made, discharge will be concentrated, but since the discharge which carried out in this way and was concentrated is not what is controlled in any way, with time amount, it moves spatially and is not stabilized. Therefore, when not preparing a part for a height in an electrode, it becomes the most suitable actuation method to extend and drive discharge on the whole surface. However, although there is little discharge current, since [that brightness is low] the margin of operation is narrow, discharge concentrates brightness and the actuation method which extends discharge on the whole surface in this way is difficult to control, if the method of raising and driver voltage are made high. Since a margin of operation becomes still narrower, it becomes moreover, less realistic, although luminous efficiency becomes high, if Xe partial pressure is used making it high. Thus, when a part for a height was not prepared in an electrode, the brightness of 5000 cd/m2 and the luminous efficiency of 15 lm/W were acquired in the same experiment.
[0082] Next, even if it does not connect an inductance or connects, when the magnitude does not suit the capacity of a device, the case where the timing which connects an inductance is unsuitable is explained. In such a case, when discharge begins, it turns out that current flows at a stretch. Although discharge is intensively local, the discharge current of the whole field is larger than the case where discharge has spread. Thus, since the rate of the contribution to luminescence becomes smaller as the discharge current becomes large, luminous efficiency falls extremely. When the discharge current was not actually controlled in this way, the brightness of 8000 cd/m2 and the luminous efficiency of 5 lm/W were acquired in the same experiment.
[0083] It turns out that the electroluminescence device of high brightness and high luminous efficiency etc. is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list. Moreover, the process in which the potential difference is given to each inter-electrode one does not necessarily need to be based on charge of a device, and may use discharge (it is not gas discharge) of a device. That is, it is also possible to change the 1st electrode 1 and the 2nd electrode 2 into Lo and Hi condition from Hi and Hi condition.
[0084] Moreover, if a fluorescent substance is separated or it does not use a fluorescent substance in the example of drawing 1 , it will become a discharge formation device.
[0085] By combining with the above-mentioned panel the circuit which realizes the above-mentioned actuation method, a lighting system is realizable.
[0086] A display unit is realizable by combining the above-mentioned lighting system with the actuation circuit of liquid crystal and liquid crystal etc.
[0087] (Gestalt 2 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0088] The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list. Moreover, it is characterized by realizing the means on which the aforementioned discharge is centralized with the configuration of the dielectric film which was formed when said gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[0089] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0090] Although the electroluminescence device of the gestalt 2 of this operation is fundamentally the same as the gestalt 1 of operation, the devices for centralizing discharge differ. Only a below different portion is explained. The actuation method, the lighting system, and the display unit are the same as the gestalt 1 of operation.
[0091] [Device structure] drawing 4 is the conceptual diagram of the electroluminescence device used with the gestalt 2 of this operation. The electroluminescence device of drawing 4 has two kinds of electrodes mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair, the 1st electrode 1, the 2nd electrode 2, and a dielectric layer 13, a protective coat 14 and a dielectric film 15, and has the reflecting layer 16 which reflects the light on the inner surface of the 2nd substrate 12 of another side, and the fluorescent substance 17 which emits light by discharge. As for the dielectric film on it, it is formed only in the part on an electrode although the dielectric layer and the protective coat are formed all over the electrode top (only in case of portion on which discharge is centralized).
[0092] A protective coat is for protecting a dielectric layer and an electrode from the spatter by discharge, and its materials, such as low SiO2, are [the secondary-electron-emission coefficient gamma] desirable from relation with a dielectric film. Although the high material of a dielectric film is [the secondary-electron-emission coefficient gamma] desirable and MgO is common, it is not limited especially.
[0093] Hereafter, the device for centralizing discharge is explained. With the gestalt of this operation, the configuration of the dielectric film formed directly or indirectly on the electrode has realized the device for centralizing discharge. In the example of drawing 4 , the dielectric film with the high secondary-electron-emission coefficient gamma is formed in the part on an electrode, discharge is formed only in this portion, and it has **** composition. The configuration of this dielectric film should just choose the optimal configuration from the balance of the degree of discharge concentration, and the degree of the below-mentioned discharge current control. This dielectric film gives the cause for carrying out discharge that it is easy to make it start locally. In addition, as a means to give the cause which carries out discharge that it is easy to make it form locally, as shown, for example in drawing 5 , the configuration of discharge can be met and the 3rd electrode 3 can also be arranged.
[0094] By driving by the actuation method of the gestalt 1 operation of the device which has a device for centralizing such discharge, the brightness of 7000 cd/m2 and the luminous efficiency of 30 lm/W were able to be acquired in the same experiment as the gestalt 1 of operation.

[0095] Next, when a protective coat is uniformly formed on an electrode, the case where it does not form at all is explained. It is the same as that of the case where a part for a height is not prepared in the electrode in the gestalt 1 of operation in these cases. When a protective coat was not formed for 5000 cds/the brightness of m2, and the luminous efficiency of 15 lm/W at all in the experiment same when a protective coat is formed uniformly as the gestalt 1 of operation, the brightness of 4000 cd/m2 and the luminous efficiency of 8 lm/W were acquired in the same experiment as the gestalt 1 of operation. It turns out that the electroluminescence device of high brightness and high luminous efficiency etc. is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list.
[0096] (Gestalt 3 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0097] The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list. Moreover, it is characterized by realizing a means to control the aforementioned discharge current by being formed when said gas discharge impresses voltage to inter-electrode, and decreasing said applied voltage to the timing which makes the discharge current control.
[0098] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0099] Although the electroluminescence device of the gestalt 3 of this operation is fundamentally the same as the gestalt 1 of operation, the means for making the discharge current control differ. Only a below different portion is explained. Device structure, the lighting system, and the display unit are the same as the gestalt 1 of operation.
[0100] The voltage waveform impressed to [actuation method] drawing 6 to the 1st electrode 1 and the 2nd electrode 2 at a conducting period is shown. This drawing (a) shows the voltage waveform impressed to the 1st electrode 1, and this drawing (b) shows the voltage waveform impressed to the 2nd electrode 2.
[0101] Drawing 6 shows only the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi. Light is made to emit continuously in a conducting period by repeating the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi, and the period when the voltage of the 1st electrode 1 changes from Hi to Lo, and the voltage of the 2nd electrode 2 changes from Lo to Hi. However, if the electrode is not covered with a dielectric layer, it is not necessary to carry out repeat reversal of the applied voltage. Moreover, a voltage waveform does not necessarily need to be a square wave and a sine wave etc. is sufficient as it. Generally the one where the rate of rise of applied voltage is smaller is easy to concentrate discharge and is convenient. Moreover, voltage may be impressed so that one of the electrodes may always serve as Hi. In this case, it is desirable for a wall charge to be eliminated to some extent within 1 period by self-elimination discharge etc.
[0102] First, in the period which changes from Hi to Lo, the voltage of the 2nd electrode 2 decreases the potential difference between the 1st electrode 1 and the 2nd electrode 2, and is discharging the capacitor of a device. At this time, it is also possible to generate self-elimination discharge and it is also possible to generate the discharge which continues considering this as a trigger.
[0103] In the period which changes from Lo to Hi, the potential difference was produced between the 1st electrode 1 and the 2nd electrode 2, and the continuing voltage of the 1st electrode 1 just made the 2nd electrode 2 negative for the 1st electrode 1, and has charged the device.
[0104] Next, if the field strength between the 1st aforementioned electrode 1 and the 2nd electrode 2 exceeds a threshold, discharge will begin. Discharge can be made to start by part for this height by designing so that line of electric force may concentrate the projection of an electrode here and field strength may become strong. As a result, discharge will be concentrated on a part for a height, without spreading in the whole inter-electrode one.
[0105] If discharge begins, the discharge current will flow between the 1st electrode 1 and the 2nd electrode 2, a fluorescent substance is excited by the ultraviolet rays generated by discharge, and light is emitted. At this time, although the discharge current begins to flow at a stretch, the voltage impressed to inter-electrode to the timing which controls buildup of this discharge current is decreased. It is the semantics which decreases the inter-electrode potential difference as decreasing the voltage impressed to inter-electrode here. For example, the inter-electrode potential difference can be decreased and the discharge current can be made it not only to decrease the applied voltage of the 1st electrode 1, but to control by impressing voltage to the 2nd electrode 2, as shown in drawing 6 .
[0106] Furthermore, the stable discharge current can be acquired by making the potential difference inter-electrode to the timing which controls fluctuation of the discharge current fluctuate. It turns out that the discharge current will become small if the discharge current is actually observed, and it becomes a gently-sloping current wave form. When a positive column is observed at this time, it turns out that it became very strong and is stable.
[0107] By such actuation method, 7000 cds/the brightness of m2, and the luminous efficiency of 25 lm/W were able to be acquired in the same experiment as the gestalt 1 of operation.
[0108] It turns out that the electroluminescence device of high brightness and high luminous efficiency etc. is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list. Moreover, the process in which the potential difference is given to each inter-electrode one does not necessarily need to be based on charge of a device, and may use discharge (it is not gas discharge) of a device. That is, it is also possible to change the 1st electrode 1 and the 2nd electrode 2 into Lo and Hi condition from Hi and Hi condition.
[0109] (Gestalt 4 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0110] The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list. Moreover, it is characterized by carrying out two or more formation of the concentrated discharge, and dividing these by the septum.
[0111] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0112] The electroluminescence device of the gestalt 4 of this operation has formed the septum, in order to control a positive column, although it is fundamentally the same as the gestalt 1 of operation.
[0113] Only a below different portion is explained. The actuation method, the lighting system, and the display unit are the same as the gestalt 1 of operation.
[0114] The conceptual diagram of the electroluminescence device used for [device structure] drawing 7 with the gestalt 4 of this operation is shown. These drawings (a) are a plan and this drawing (b), and (c) is a cross section. The electroluminescence device of drawing 7 has two kinds of electrodes mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair,

the 1st electrode 1, the 2nd electrode 2, and a dielectric layer 13 and a protective coat 14, and has the reflecting layer 16 which reflects the light on the inner surface of the 2nd substrate 12 of another side, the septum 18 with which discharge space is divided, and the fluorescent substance 17 which emits light by discharge.
[0115] Although it is common to use low melting glass as construction material of a septum, it is not limited especially. Moreover, the configuration of a septum can also be designed in accordance with a discharge configuration. Moreover, the septum does not necessarily need to be in contact with both the 1st substrate 11 and the 2nd substrate 12.
[0116] Hereafter, the effect of a septum is explained. Control of discharge becomes easy by establishing a wall etc. in the first place near the positive column discharge first. For example, although two or more discharge concentrated with a device or/and a means as shown in the gestalt 1 of operation can be formed, a very stable positive column can be obtained by controlling by the septum which prepared each discharge in each near. Since control of discharge will generally become difficult if especially discharge is centralized, it is dramatically effective. Configurations, such as height of a septum, serve as an important parameter of controlling the discharge.
[0117] preparing unevenness in the configuration inside a device the second -- fluorescent substance surface area -- large -- it can carry out -- brightness -- it can raise .
[0118] A pile device is realizable for a crack by third using a septum as a spacer.
[0119] According to such device structure, the brightness of 9000 cd/m2 and the luminous efficiency of 35 lm/W were able to be acquired in the same experiment as the gestalt 1 of operation.
[0120] By carrying out two or more formation of the discharge further concentrated by ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list, and dividing these by the septum shows that the electroluminescence device of high brightness and high luminous efficiency etc. is realizable.
[0121] (Gestalt 5 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing. The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list. Moreover, it is characterized by having the device which the concentrated discharge is formed, and emits light by this, and diffuses the luminescence.
[0122] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0123] Although the electroluminescence device of the gestalt 5 of this operation is fundamentally the same as the gestalt 1 of operation, the device which diffuses luminescence is established.
[0124] Only a below different portion is explained. The actuation method, the lighting system, and the display unit are the same as the gestalt 1 of operation.
[0125] [Device structure] drawing 8 is the conceptual diagram of the electroluminescence device used with the gestalt 5 of this operation. The electroluminescence device of drawing 8 has two kinds of electrodes mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair, the 1st electrode 1, the 2nd electrode 2, and a dielectric layer 13, a protective coat 14 and a dielectric film 15, has the diffusion board 19 on the outside surface of the 1st substrate 11, and has the reflecting layer 16 which reflects the light on the inner surface of the 2nd substrate 12 of another side, and the fluorescent substance 17 which emits light by discharge.
[0126] The device which diffuses luminescence is not limited especially that what is necessary is just that to which the direction of luminescence from the light source is changed. For example, it has a prism configuration and an uneven configuration on one side, and what diffuses light by making it a suitable reflection factor and suitable permeability, the thing in which the hole suitable in order to secure luminescence from the light source is prepared can be considered.
[0127] These configurations, arrangement, etc. are designed by arrangement of the concentrated discharge, reinforcement, etc. the optimal.
[0128] Luminescence serves as homogeneity according to this diffusion device.
[0129] (Gestalt 6 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0130] The plasma display panel explained with the gestalt of this operation, the actuation method, and its display unit can control luminescence by gas discharge for every pixel, and it is characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list.
[0131] Moreover, it is formed when said gas discharge impresses voltage to inter-electrode, and it is characterized by realizing the means on which the aforementioned discharge is centralized with the configuration of said electrode.
[0132] Moreover, it is characterized by realizing a means to control the aforementioned discharge current by being formed when said gas discharge impresses voltage to inter-electrode, and connecting an inductance at least to one side of said electrode at a serial.
[0133] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0134] [Panel structure] drawing 9 is the conceptual diagram of the plasma display panel used with the gestalt 6 of this operation. Two kinds of electrodes with the plasma display panel of drawing 9 mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair, the 1st electrode 1, and the 2nd electrode 2, It has a dielectric layer 13 and a protective coat 14, and has the 3rd electrode 3 formed in the direction which intersects said 1st electrode 1 on the inner surface of the 2nd substrate 12 of another side, the reflecting layer 16 which reflects the light, the septum 18 with which discharge space is divided, and the fluorescent substance 17 which emits light by discharge. It is 0.2mm or more in which the inter-electrode distance of the 2nd electrode 2 can form positive column discharge for the 1st electrode 1.
[0135] Although soda lime glass is common as a material of a substrate, it is not limited especially. Although it is common to be formed with silver, or chromium / copper / chromium (laminated structure) as for an electrode, it is not limited especially. Although it is common to use low melting glass as a material of a septum, it is not limited especially. A fluorescent substance is excited by the ultraviolet rays generated in discharge, and especially if light is emitted, it will not be limited. Although it is common to use low melting glass as construction material of a dielectric, it is not limited especially. Although the high material of a protective coat is [the secondary-electron-emission coefficient gamma] desirable and MgO is common, it is not limited especially. Although mixed gas or Xe gas of discharge gas of a kind and Xe is common at least among helium, Ne, and Ar, it is not limited especially. Moreover, the electrode necessarily needs to be covered neither by the dielectric layer nor the protective coat. Moreover, the 1st electrode 1 and the 2nd electrode 2 do not necessarily need to be formed in the inner surface of the same substrate. Moreover, the gestalt of discharge does not necessarily need to be a positive column, therefore the inter-electrode distance of the 1st electrode 1 and the 2nd electrode 2 is arbitrary. However, luminous efficiency improves greatly by positive column discharge, and an effect is large [this invention] especially in case this invention uses positive column discharge.

[0136] Hereafter, the device for centralizing discharge is explained. With the gestalt of this operation, the configuration of an electrode has realized the device for centralizing discharge. The projection is formed in some electrodes, and in case voltage is impressed to inter-electrode, it consists of examples of drawing 9 so that line of electric force may focus and field strength may become large. The configuration for a height should just choose the optimal configuration from the balance of the degree of discharge concentration, and the degree of the below-mentioned discharge current control. If discharge can be centralized, it is not necessarily to be necessarily a projection. For example, it is also possible by narrowing inter-electrode distance only in a field with an electrode to centralize discharge.
[0137] The device on which discharge is centralized here does not necessarily need to be formed in both the 1st electrode 1 and the 2nd electrode 2. For example, in a certain discharge field, a projection is prepared in the 1st electrode 1, and the shape of linear then and discharge concentrate the 2nd electrode 2 by the 1st electrode 1 side, and in this field, it becomes a triangular discharge configuration and becomes a radii configuration, then a sector discharge configuration about the 2nd electrode 2. Moreover, when forming two or more these, in a certain field, a projection may be prepared only in the 1st electrode 1, and a projection may be prepared only in the 2nd electrode 2 in another field. Moreover, two or more formation does not necessarily have to be carried out. Moreover, there may not be the need that the roles of two kinds of electrodes not necessarily differ, and may completely be equivalent. That is, the polarity of the applied voltage of each electrode may be fixed and you may change by turns.
[0138] Next, a means to control the discharge current is explained. With the gestalt of this operation, the device or means for controlling the discharge current is realized by connecting an inductance at least to one side of an electrode at a serial. Under the present circumstances, if the effect which controls the discharge current is brought about, it is not necessary to not necessarily generate back EMF (for example, inductance).
[0139] These effects are explained using the example driven by the actuation method below.
[0140] The voltage waveform impressed to [actuation method] drawing 10 to the 1st electrode 1, the 2nd electrode 2, and the 3rd electrode 3 at the maintenance period of discharge is shown. This drawing (a) shows the voltage waveform impressed to the 1st electrode 1, this drawing (b) shows the voltage waveform impressed to the 2nd electrode 2, and this drawing (c) shows the voltage waveform impressed to the 3rd electrode 3. Drawing 10 shows only the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi. This voltage waveform is an output wave from a circuit, and the voltage waveform actually built over an electrode changes with below-mentioned inductances.
[0141] Light is made to emit continuously in the maintenance period of discharge by repeating the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi, and the period when the voltage of the 1st electrode 1 changes from Hi to Lo, and the voltage of the 2nd electrode 2 changes from Lo to Hi. However, if the electrode is not covered with a dielectric layer, it is not necessary to carry out repeat reversal of the applied voltage. Moreover, a voltage waveform does not necessarily need to be a square wave and a sine wave etc. is sufficient as it. Generally the one where the rate of rise of applied voltage is smaller is easy to concentrate discharge and is convenient. Moreover, voltage may be impressed so that one of the electrodes may always serve as Hi. In this case, it is desirable for a wall charge to be eliminated to some extent within 1 period by self-elimination discharge etc.
[0142] First, in the period which changes from Hi to Lo, the voltage of the 2nd electrode 2 decreases the potential difference between the 1st electrode 1 and the 2nd electrode 2, and is discharging the capacitor of a panel. At this time, it is also possible to generate self-elimination discharge and it is also possible to generate the discharge which continues considering this as a trigger.
[0143] In the period which changes from Lo to Hi, the potential difference was produced between the 1st electrode 1 and the 2nd electrode 2, and the continuing voltage of the 1st electrode 1 just made the 2nd electrode 2 negative for the 1st electrode 1, and has charged the panel.
[0144] Next, if the field strength between the 1st aforementioned electrode 1 and the 2nd electrode 2 exceeds a threshold, discharge will begin. Discharge can be made to start by part for this height by designing so that line of electric force may concentrate the projection of an electrode here and field strength may become strong. As a result, discharge will be concentrated on a part for a height, without spreading in the whole inter-electrode one.
[0145] If discharge begins, the discharge current will flow between the 1st electrode 1 and the 2nd electrode 2, a fluorescent substance is excited by the ultraviolet rays generated by discharge, and light is emitted. Although the discharge current begins to flow at a stretch at this time, back EMF occurs with the inductance connected at least to one side of an electrode at the serial, and the discharge current is controlled. Under the present circumstances, if the effect which controls the discharge current is brought about, it is not necessary to not necessarily generate back EMF (for example, inductance). Moreover, you may connect to the timing which controls buildup of the discharge current, and an inductance may be connected beforehand. Moreover, what is necessary is just to choose an inductance in accordance with the capacity of a panel so that the discharge current may be controlled suitably since the optimal magnitude changes with capacity of a panel.
[0146] It turns out that the discharge current will become small if the discharge current is actually observed, and it becomes a gently-sloping current wave form. It not only controls the discharge current, but an inductance is for also controlling fluctuation of the discharge current in order to carry out back EMF generating in self-adapting by change of the discharge current. When a positive column is observed at this time, it turns out that it became very strong and is stable.
[0147] Thus, by driving, the brightness of 500 cd/m2 and the luminous efficiency of 4 lm/W were able to be acquired by the gaseous mixture (Xe is 10%) of Xe and Ne.
[0148] Next, the case where a part for a height is not prepared in an electrode is explained. When not preparing a part for a height in an electrode, discharge can be extended all over 1 cel (unit luminescence field) by choosing the optimal conditions. Although the optimal conditions can be found by investigating the conditions of the BARUSU width of face of applied voltage, or timing chiefly, as for this actuation margin, generally, what it is hard to control narrowly is actual. If optimization is not made, discharge will be concentrated, but since the discharge which carried out in this way and was concentrated is not what is controlled in any way, with time amount, it moves spatially and is not stabilized. Therefore, when not preparing a part for a height in an electrode, it becomes the most suitable actuation method to extend discharge all over 1 cel and to drive it.
[0149] However, although there is little discharge current, since [that brightness is low] the margin of operation is narrow, discharge concentrates brightness and the actuation method which extends discharge on the whole surface in this way is difficult to control, if the method of raising and driver voltage are made high. Since a margin of operation becomes still narrower, it becomes moreover, less realistic, although luminous efficiency becomes high, if Xe partial pressure is used making it high. Thus, when a part for a height was not prepared in an electrode, the brightness of 300 cd/m2 and the luminous efficiency of 2 lm/W were acquired in the same experiment.
[0150] Next, even if it does not connect an inductance or connects, when the magnitude does not suit the capacity of a panel, the case where the timing which connects an inductance is unsuitable is explained. In such a case, when discharge begins, it turns out that current flows at a stretch. Although discharge is intensively local, the discharge current of the whole field is larger than the case where discharge has spread.

Thus, since the rate of the contribution to luminescence becomes smaller as the discharge current becomes large, luminous efficiency falls extremely. When the discharge current was not actually controlled in this way, the brightness of 400 cd/m2 and the luminous efficiency of 0.5 lm/W were acquired in the same experiment.

[0151] It turns out that the plasma display panel of high brightness and high luminous efficiency is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list.

[0152] Moreover, the process in which the potential difference is given to each inter-electrode ones does not necessarily need to be based on charge of a panel, and may use discharge (it is not gas discharge) of a panel. That is, it is also possible to change the 1st electrode 1 and the 2nd electrode 2 into Lo and Hi condition from Hi and Hi condition.

[0153] The 1st above-mentioned electrode 1, the 2nd electrode 2, and the 3rd electrode 3 bear the scanning electrode shown below in a [display unit], a sustain electrode, and an address electrode.

[0154] Drawing 11 is the block diagram showing the configuration of the display unit in the gestalt of this operation. The display unit of drawing 11 contains PDP100, the address driver 110, the scanning driver 120, the sustain driver 130, the controlling-the-discharge timing generating circuit 140, A/D converter (analog-to-digital converter) 151, the number converter 152 of scans, and the subfield converter 153.

[0155] Including the address electrode of plurality [PDP /100], two or more scanning electrodes (scan electrode), and two or more sustain electrodes (maintenance electrode), two or more address electrodes are arranged to the perpendicular direction of a screen, and two or more scanning electrode and two or more sustain electrodes are arranged to the horizontal direction of a screen. Moreover, two or more sustain electrodes are connected in common. Moreover, a discharge cel is formed in each intersection of an address electrode, a scanning electrode, and a sustain electrode, and each discharge cel constitutes the pixel on a screen.

[0156] After performing address discharge between an address electrode and a scanning electrode and choosing a discharge cel by writing in between an address electrode and a scanning electrode and impressing a pulse to this PDP100, it displays by performing maintenance discharge between a scanning electrode and a sustain electrode by impressing periodic maintenance BARUSU reversed by turns between a scanning electrode and a sustain electrode.

[0157] As a gradation display actuation method in the AC mold PDP, an ADS (Address andDisplay-period Separated: address and display period separation) method can be used, for example. Drawing 12 is drawing for explaining ADS. The axis of ordinate of drawing 12 shows the scanning direction (the direction of a vertical scanning) of the scanning electrode from the 1st line to the m-th line, and a horizontal axis shows time amount. In ADS, the 1 field (1/60 second = 16.67ms) is divided into two or more subfields in time. For example, the 1 field is divided into eight subfields when performing 256 gradation displays by 8 bits. Moreover, each subfield is divided into the address period when address discharge for burning cel selection is performed, and the maintenance period when maintenance discharge for a display is performed. In ADS, the scan by address discharge is performed on the whole surface of PDP from the 1st line to the m-th line in each subfield, and maintenance discharge is performed at the time of whole surface address discharge termination.

[0158] First, a video signal VD is inputted into an A/D converter. Moreover, Horizontal Synchronizing signal H and Vertical Synchronizing signal V are given to a controlling-the-discharge timing generating circuit, an A/D converter, the number converter of scans, and a subfield converter. An A/D converter changes a video signal VD into a digital signal, and gives the image data to the number converter of scans. The number converter of scans changes image data into the image data of the number of lines according to the number of pixels of PDP, and gives the image data for every Rhine to a subfield converter.

[0159] A subfield converter divides each pixel data of the image data for every Rhine into two or more bits corresponding to two or more subfields, and outputs each bit of each pixel data to an address driver serially for every rust field. It connects with the power circuit 111, and an address driver changes into parallel data the data serially given for every subfield from a subfield converter, and drives two or more address electrodes based on the parallel data.

[0160] A controlling-the-discharge timing generating circuit generates the controlling-the-discharge timing signals SC and SU on the basis of Horizontal Synchronizing signal H and Vertical Synchronizing signal V, and gives them respectively to a scanning driver and a sustain driver. A scanning driver contains an output circuit 121 and a shift register 122. Moreover, a sustain driver contains an output circuit 131 and a shift register 132. These scanning drivers and a sustain driver are connected to the common power circuit 123.

[0161] It is given to an output circuit, the shift register of a scanning driver shifting controlling-the-discharge timing signal SC given from a controlling-the-discharge timing generating circuit in the direction of a vertical scanning. An output circuit answers controlling-the-discharge timing signal SC given from a shift register, and drives two or more scanning electrodes in order.

[0162] It is given to an output circuit, the shift register of a sustain driver shifting the controlling-the-discharge timing signal SU given from a controlling-the-discharge timing generating circuit in the direction of a vertical scanning. An output circuit answers the controlling-the-discharge timing signal SU given from a shift register, and drives two or more sustain electrodes in order.

[0163] Drawing 13 is a timing chart which shows the driver voltage impressed to each electrode of PDP100. The driver voltage of an address electrode, a sustain electrode, and the scanning electrode of the n-th line - ** (n+2) is shown by drawing 13 .

[0164] Here, n is the integer of arbitration. As shown in drawing 13 , in a luminescence period, the sustain pulse Psu is impressed to a sustain electrode a fixed period. It writes in a scanning electrode and Pulse Pw is impressed to an address period. Synchronizing with this write-in pulse, it writes in an address electrode, and Pulse Pwa is impressed. Turning on and off of the write-in pulse Pwa impressed to an address electrode is controlled according to each pixel of the image to display.

[0165] If it writes in with the write-in pulse Pw and Pulse Pwa is impressed simultaneously, address discharge will occur in the discharge cel of the intersection of a scanning electrode and an address electrode, and the discharge cel will light up. The maintenance pulse Psc is impressed to a scanning electrode a fixed period at the maintenance period after an address period. The phase of the maintenance pulse Psc impressed to a scanning electrode has shifted 180 degrees to the phase of the sustain pulse Psc impressed to a sustain electrode. In this case, maintenance discharge occurs only in the discharge cel turned on by address discharge.

[0166] At the time of termination of each subfield, a blanking pulse Pe is impressed to a scanning electrode. The wall charge of each discharge cel decreases by that cause to the degree in which dissipation or maintenance discharge does not occur, and maintenance discharge is completed. The pause pulse Pr is impressed to a scanning electrode a fixed period at the idle period after impression of a blanking pulse Pe. This pause pulse Pr is the sustain pulse Psu and equiphase.

[0167] In addition, the details about the actuation method of a maintenance period are as given in the above [the actuation method].

[0168] (Gestalt 7 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.

[0169] The plasma display panel explained with the gestalt of this operation, the actuation method, and its display unit can control luminescence by gas discharge for every pixel, and it is characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list.

[0170] Moreover, it is characterized by realizing the means on which the aforementioned discharge is centralized with the configuration of the dielectric film which was formed when said gas discharge impressed voltage to inter-electrode, and was formed directly or indirectly on said electrode.
[0171] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0172] Although the plasma display panel of the gestalt 7 of this operation is fundamentally the same as the gestalt 6 of operation, the devices for centralizing discharge differ. Only a below different portion is explained. The actuation method and the display unit are the same as the gestalt 6 of operation.
[0173] [Panel structure] drawing 14 is the conceptual diagram of the plasma display panel used with the gestalt 7 of this operation. Two kinds of electrodes with the plasma display panel of drawing 14 mutual almost parallel on the inner surface of one [which faces across discharge space] 1st substrate 11 of a substrate pair, the 1st electrode 1, and the 2nd electrode 2, It has a dielectric layer 13, a protective coat 14, and a dielectric film 15, and has the 3rd electrode 3 formed in the direction which intersects said 1st electrode 1 on the inner surface of the 2nd substrate 12 of another side, the reflecting layer 16 which reflects the light, and the fluorescent substance 17 which emits light by discharge.
[0174] A protective coat is for protecting a dielectric layer and an electrode from the spatter by discharge, and its materials, such as low SiO2, are [the secondary-electron-emission coefficient gamma] desirable from relation with a dielectric film. Although the high material of a dielectric film is [the secondary-electron-emission coefficient gamma] desirable and MgO is common, it is not limited especially.
[0175] Hereafter, the device for centralizing discharge is explained. With the gestalt of this operation, the configuration of the dielectric film formed directly or indirectly on the electrode has realized the device for centralizing discharge. In the example of drawing 14 , the dielectric film with the high secondary-electron-emission coefficient gamma is formed in the part on an electrode, discharge is formed only in this portion, and it has **** composition. The configuration of this dielectric film should just choose the optimal configuration from the balance of the degree of discharge concentration, and the degree of the below-mentioned discharge current control. This dielectric film gives the cause for carrying out discharge that it is easy to make it start locally.
[0176] By driving by the actuation method of the gestalt 6 operation of the plasma display panel which has a device for centralizing such discharge, 400 cds/the brightness of m2, and the luminous efficiency of 3.5 lm/W were able to be acquired in the same experiment as the gestalt 6 of operation.
[0177] Next, when a protective coat is uniformly formed on an electrode, the case where it does not form at all is explained. It is the same as that of the case where a part for a height is not prepared in the electrode in the gestalt 6 of operation in these cases. When a protective coat was not formed for 300 cds/the brightness of m2, and the luminous efficiency of 2 lm/W at all in the experiment same when a protective coat is formed uniformly as the gestalt 6 of operation, the brightness of 150 cd/m2 and the luminous efficiency of 0.6 lm/W were acquired in the same experiment as the gestalt 6 of operation. It turns out that the plasma display panel of high brightness and high luminous efficiency is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list.
[0178] (Gestalt 8 of operation) The gestalt of operation of this invention is explained hereafter, referring to a drawing.
[0179] The electroluminescence device explained with the gestalt of this operation, the actuation method, a lighting system, and a display unit are characterized by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list.
[0180] Moreover, it is characterized by realizing a means to control the aforementioned discharge current by being formed when said gas discharge impresses voltage to inter-electrode, and decreasing said applied voltage to the timing which makes the discharge current control.
[0181] Although it explains hereafter while an example is shown about the gestalt of this operation, the mode of operation of this invention is not limited to this.
[0182] Although the plasma display panel of the gestalt 8 of this operation is fundamentally the same as the gestalt 6 of operation, the means for making the discharge current control differ. Only a below different portion is explained. Panel structure and a display unit are the same as the gestalt 6 of operation.
[0183] The voltage waveform impressed to [actuation method] drawing 15 to the 1st electrode 1, the 2nd electrode 2, and the 3rd electrode 3 at the maintenance period of discharge is shown. This drawing (a) shows the voltage waveform impressed to the 1st electrode 1, this drawing (b) shows the voltage waveform impressed to the 2nd electrode 2, and this drawing (c) shows the voltage waveform impressed to the 3rd electrode 3. Drawing 15 shows only the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi. Light is made to emit continuously in the maintenance period of discharge by repeating the period when the voltage of the 2nd electrode 2 changes from Hi to Lo, and the voltage of the 1st electrode 1 changes from Lo to Hi, and the period when the voltage of the 1st electrode 1 changes from Hi to Lo, and the voltage of the 2nd electrode 2 changes from Lo to Hi. However, if the electrode is not covered with a dielectric layer, it is not necessary to carry out repeat reversal of the applied voltage.
[0184] Moreover, a voltage waveform does not necessarily need to be a square wave and a sine wave etc. is sufficient as it. Generally the one where the rate of rise of applied voltage is smaller is easy to concentrate discharge and is convenient. Moreover, voltage may be impressed so that one of the electrodes may always serve as Hi. In this case, it is desirable for a wall charge to be eliminated to some extent within 1 period by self-elimination discharge etc.
[0185] First, in the period which changes from Hi to Lo, the voltage of the 2nd electrode 2 decreases the potential difference between the 1st electrode 1 and the 2nd electrode 2, and is discharging the capacitor of a panel. At this time, it is also possible to generate self-elimination discharge and it is also possible to generate the discharge which continues considering this as a trigger.
[0186] In the period which changes from Lo to Hi, the potential difference was produced between the 1st electrode 1 and the 2nd electrode 2, and the continuing voltage of the 1st electrode 1 just made the 2nd electrode 2 negative for the 1st electrode 1, and has charged the panel.
[0187] Next, if the field strength between the 1st aforementioned electrode 1 and the 2nd electrode 2 exceeds a threshold, discharge will begin. Discharge can be made to start by part for this height by designing so that line of electric force may concentrate the projection of an electrode here and field strength may become strong. As a result, discharge will be concentrated on a part for a height, without spreading in the whole inter-electrode one.
[0188] If discharge begins, the discharge current will flow between the 1st electrode 1 and the 2nd electrode 2, a fluorescent substance is excited by the ultraviolet rays generated by discharge, and light is emitted. At this time, although the discharge current begins to flow at a stretch, the voltage impressed to inter-electrode to the timing which controls buildup of this discharge current is decreased. It is the semantics which decreases the inter-electrode potential difference as decreasing the voltage impressed to inter-electrode here. For example, the inter-electrode potential difference can be decreased and the discharge current can be made it not only to decrease the applied voltage of the 1st

electrode 1, but to control by impressing voltage to the 2nd electrode 2, as shown in drawing 15 .
[0189] Furthermore, the stable discharge current can be acquired by making the potential difference inter-electrode to the timing which controls fluctuation of the discharge current fluctuate. It turns out that the discharge current will become small if the discharge current is actually observed, and it becomes a gently-sloping current wave form. When a positive column is observed at this time, it turns out that it became very strong and is stable.
[0190] By such actuation method, 300 cds/the brightness of m2, and the luminous efficiency of 3 lm/W were able to be acquired in the same experiment as the gestalt 6 of operation.
[0191] It turns out that the plasma display panel of high brightness and high luminous efficiency is realizable with ** which has the means on which discharge is centralized from these results, and a means to control the discharge current which originates in said discharge at a list.
[0192] Moreover, the process in which the potential difference is given to each inter-electrode ones does not necessarily need to be based on charge of a panel, and may use discharge (it is not gas discharge) of a panel. That is, it is also possible to change the 1st electrode 1 and the 2nd electrode 2 into Lo and Hi condition from Hi and Hi condition.
[0193]
[Effect of the Invention] It becomes possible to form very strong stable positive column discharge by having the means on which discharge is centralized, and a means to control the discharge current which originates in said discharge at a list so that clearly from the gestalt of operation of this invention. Thereby, high brightness, high luminous efficiency and the electroluminescence device in which stable discharge is possible, a plasma display panel, a display unit, etc. can be offered.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing that of the electroluminescence device in the gestalt of operation of this invention 1st
[Drawing 2] Drawing showing that of the electroluminescence device in the gestalt of this 1st operation
[Drawing 3] Drawing showing the voltage waveform impressed to the conducting period in the gestalt of this 1st operation to each electrode
[Drawing 4] Drawing showing that of the electroluminescence device in the gestalt of this 2nd operation
[Drawing 5] Drawing showing that of the electroluminescence device in the gestalt of this 2nd operation
[Drawing 6] Drawing showing the voltage waveform impressed to the conducting period in the gestalt of this 3rd operation to each electrode
[Drawing 7] Drawing showing that of the electroluminescence device in the gestalt of this 4th operation
[Drawing 8] Drawing showing that of the electroluminescence device in the gestalt of this 5th operation
[Drawing 9] Drawing showing the plasma display panel in the gestalt of this 6th operation
[Drawing 10] Drawing showing the voltage waveform impressed to the maintenance period of the discharge in the gestalt of this 6th operation to each electrode
[Drawing 11] Drawing showing the configuration of the display unit in the gestalt of this 6th operation
[Drawing 12] Drawing showing the ADS in the gestalt of this 6th operation
[Drawing 13] Drawing showing the driver voltage impressed to each electrode of PDP in the gestalt of this 6th operation
[Drawing 14] Drawing showing the plasma display panel in the gestalt of this 7th operation
[Drawing 15] Drawing showing the voltage waveform impressed to the maintenance period of the discharge in the gestalt of this 8th operation to each electrode
[Drawing 16] Drawing showing the conventional flat-surface mold discharge lamp
[Drawing 17] Drawing showing the field discharge mold PDP of 3 conventional electrode structures
[Description of Notations]
1 1st Electrode
2 2nd Electrode
3 3rd Electrode
11 1st Substrate
12 2nd Substrate
13 Dielectric Layer
14 Protective Coat
15 Dielectric Film
16 Reflecting Layer
17 Fluorescent Substance
18 Septum
19 Diffusion Board
20 Spacer
21 Scanning Electrode
22 Sustain Electrode
23 Address Electrode
100 PDP
110 Address Driver
111 Power Circuit of Address Driver
120 Scanning Driver
121 Output Circuit of Scanning Driver
122 Shift Register of Scanning Driver
123 Power Circuit Common to Scanning Driver and Sustain Driver
130 Sustain Driver
131 Output Circuit of Sustain Driver
132 Shift Register of Sustain Driver
140 Controlling-the-Discharge Timing Generating Circuit
151 A/D Converter
152 The Number Converter of Scans
153 Subfield Converter

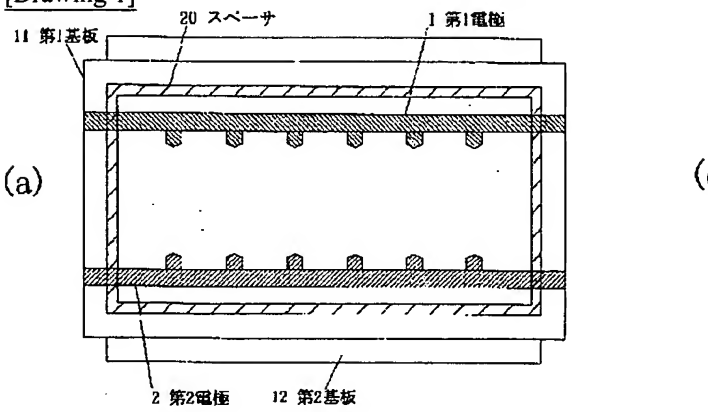
[Translation done.]

* NOTICES *

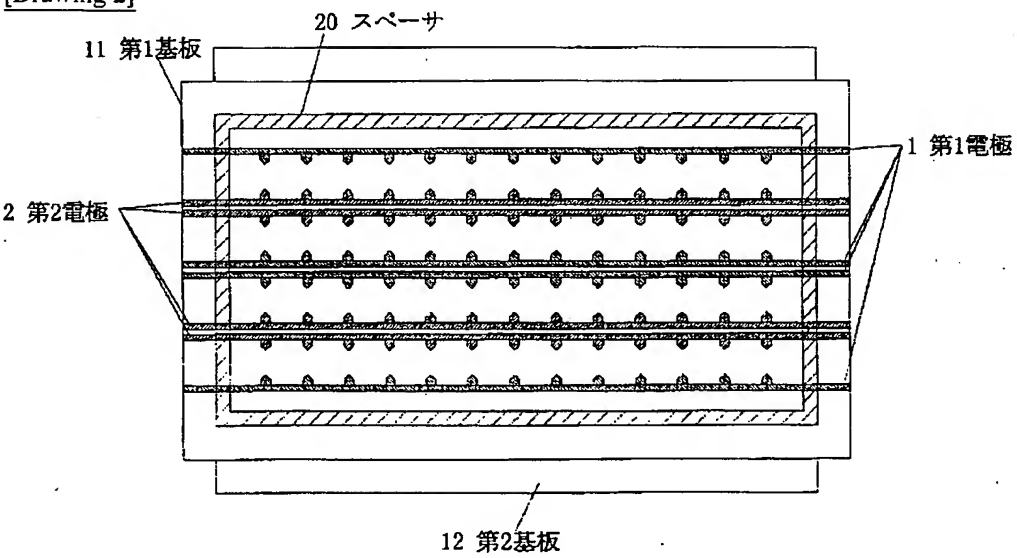
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

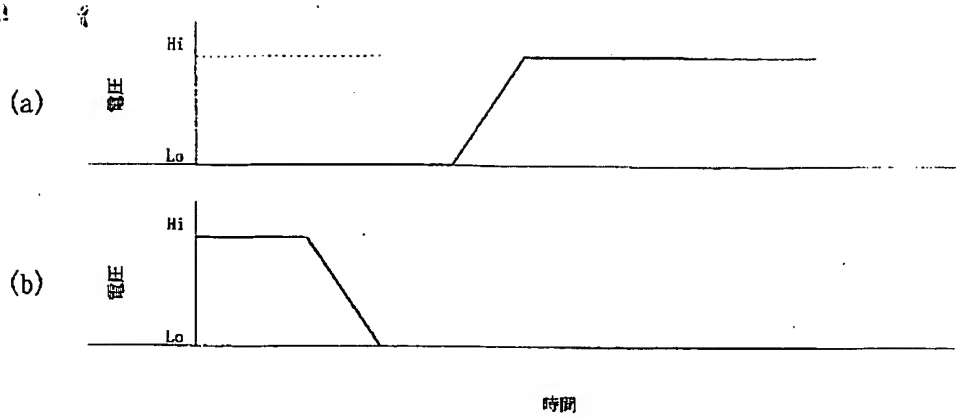
[Drawing 1]



[Drawing 2]



[Drawing 3]



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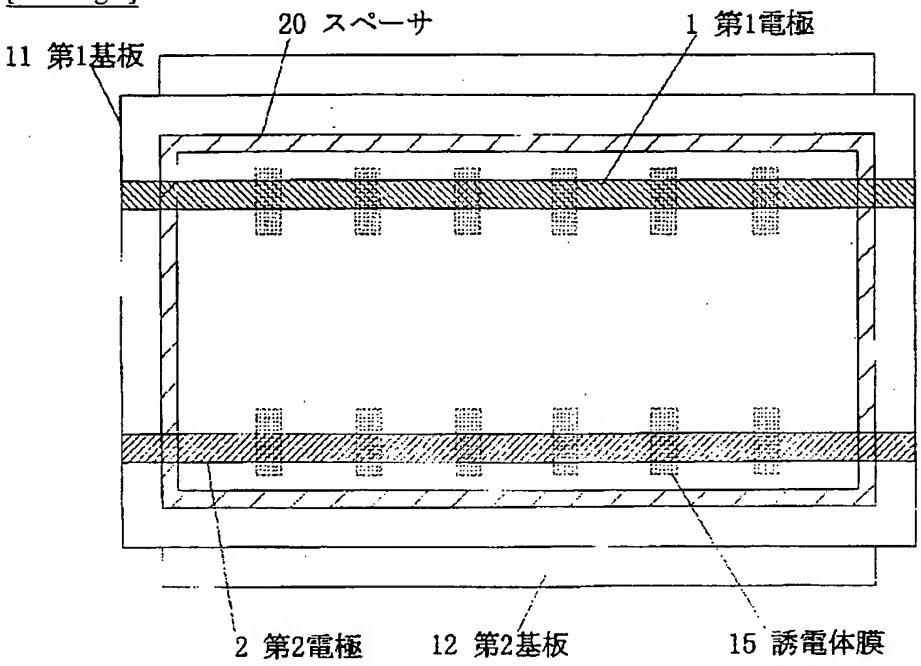
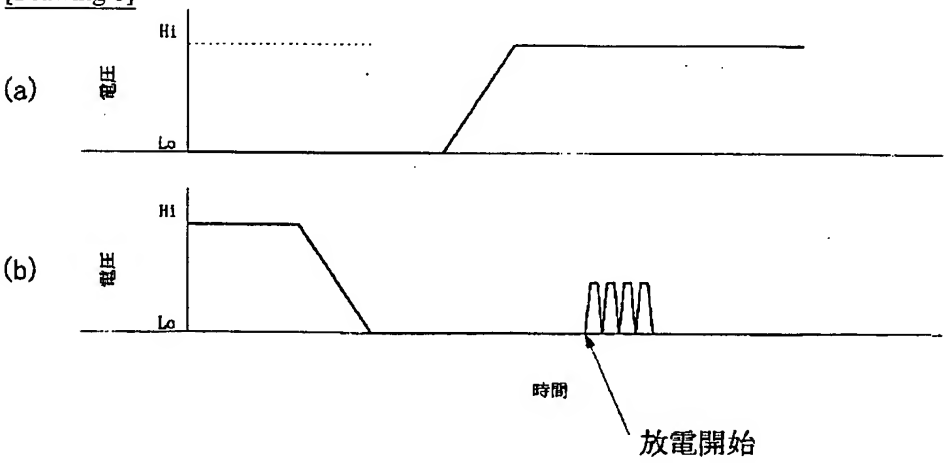
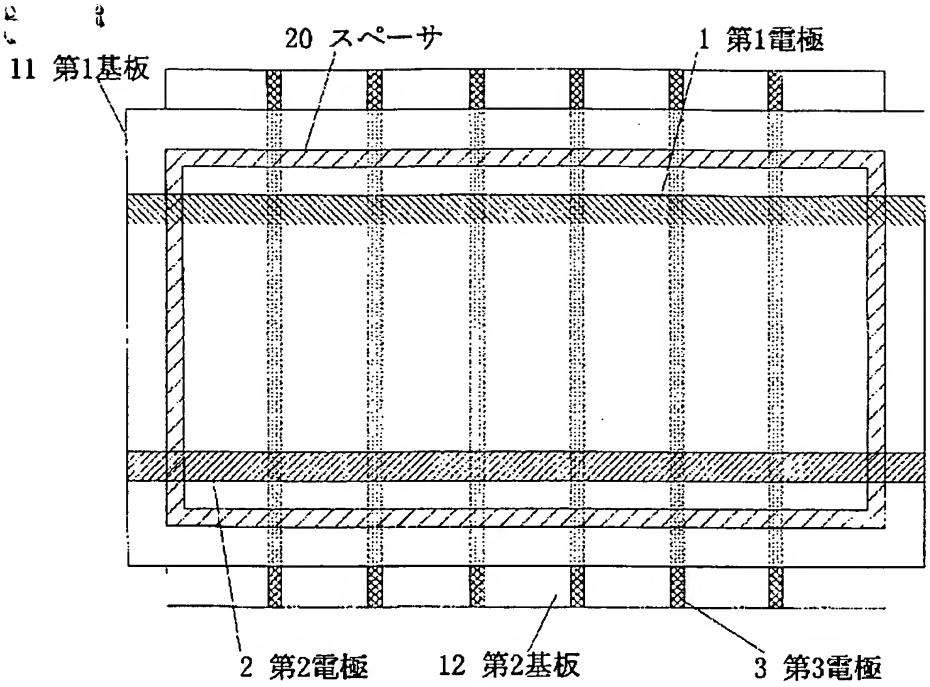


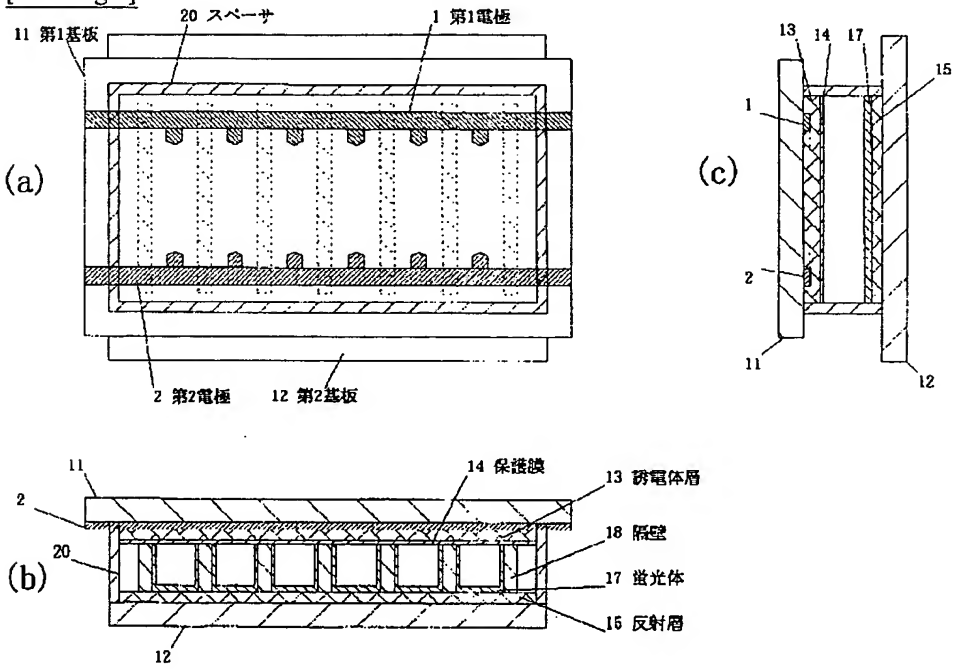
[Drawing 6]



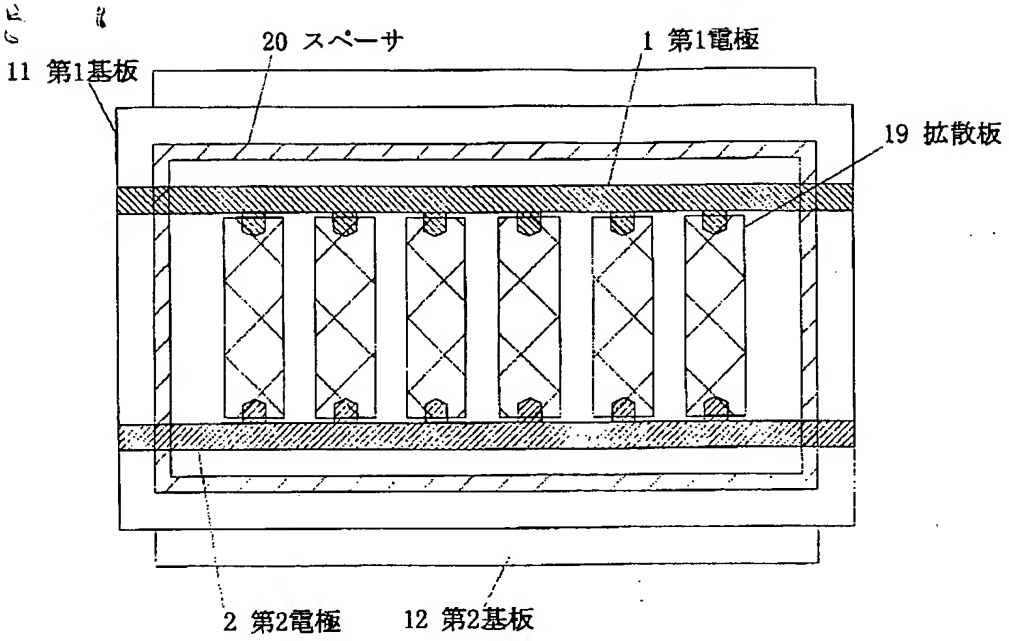
[Drawing 5]



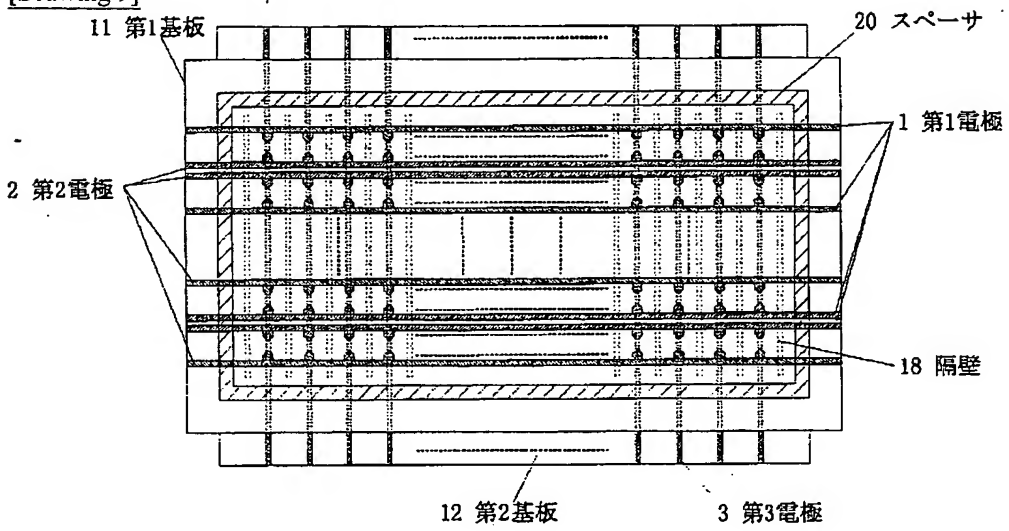
[Drawing 7]



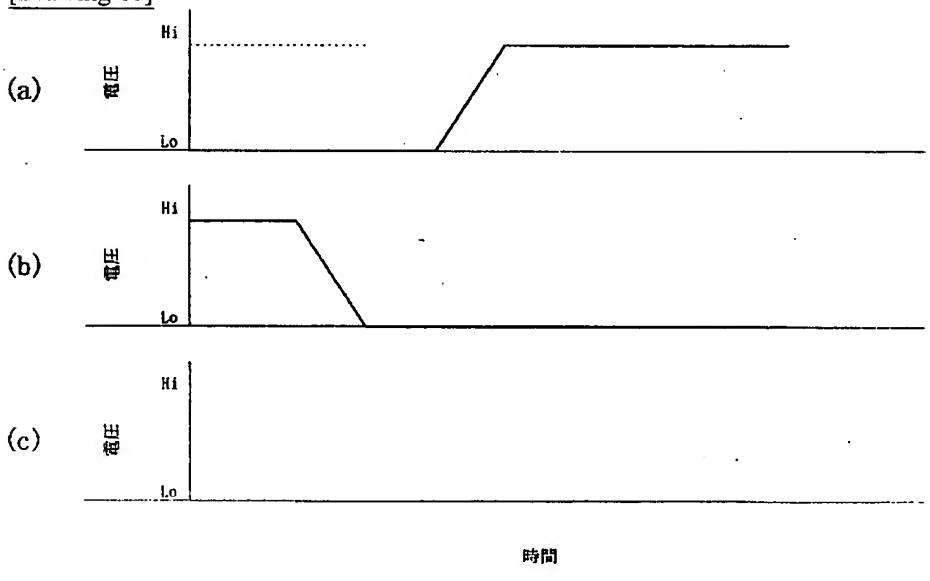
[Drawing 8]



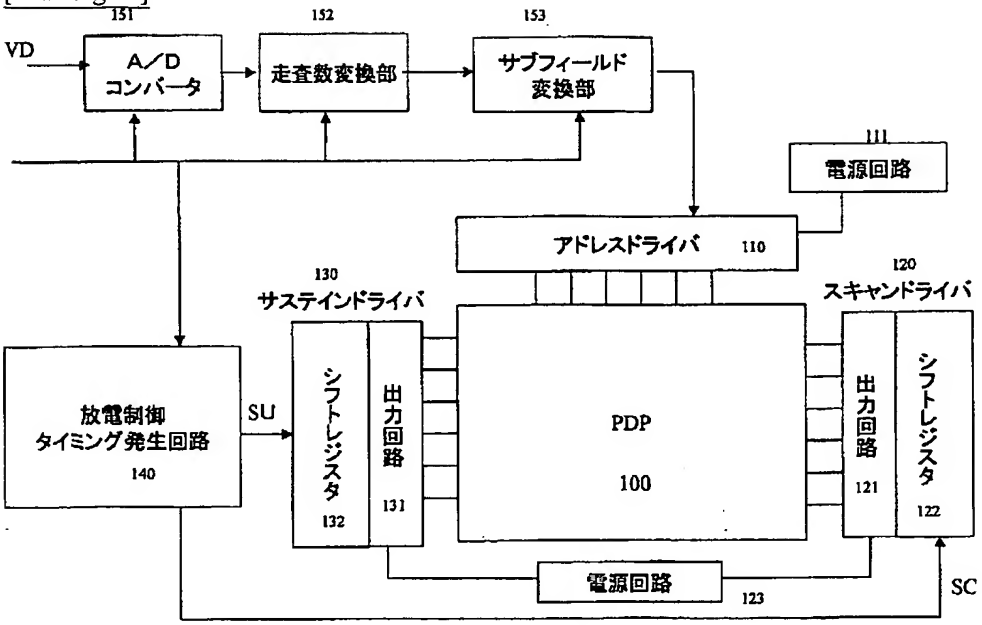
[Drawing 9]



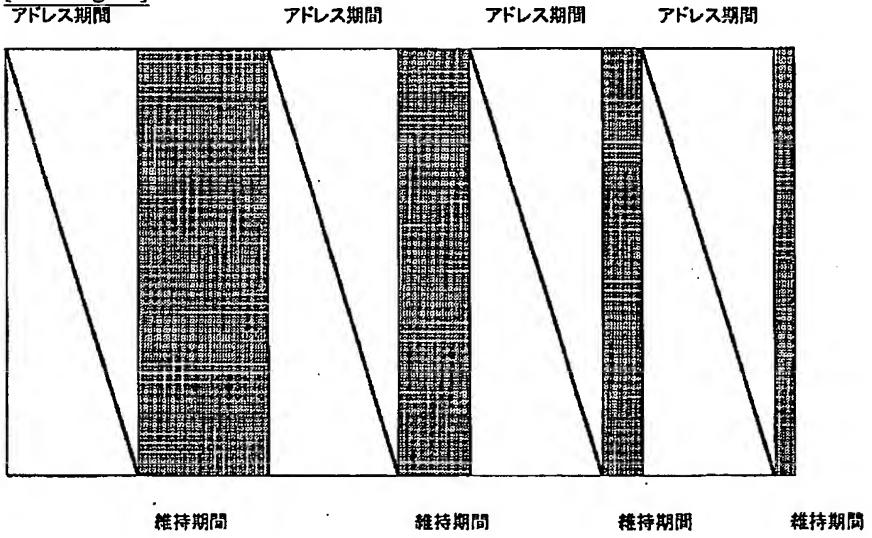
[Drawing 10]



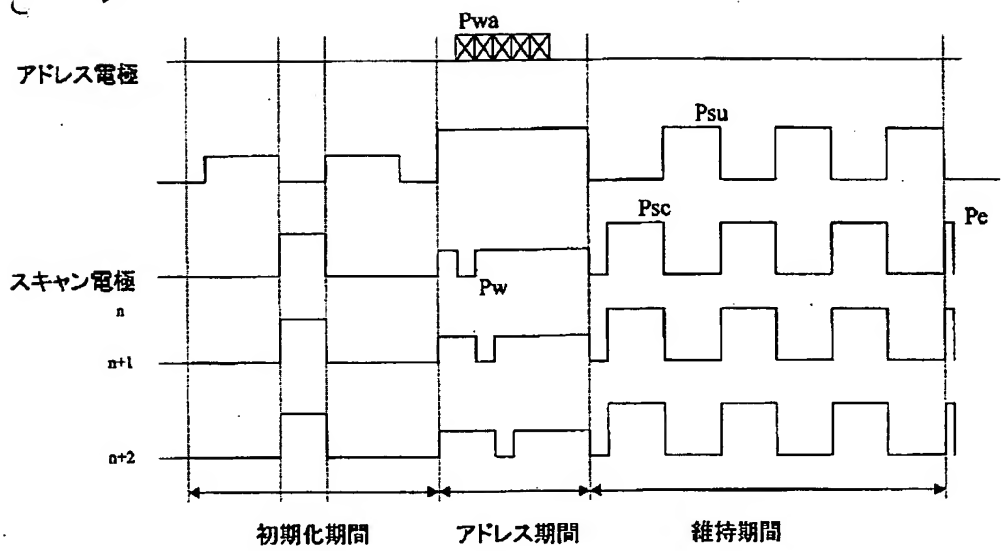
[Drawing 11]



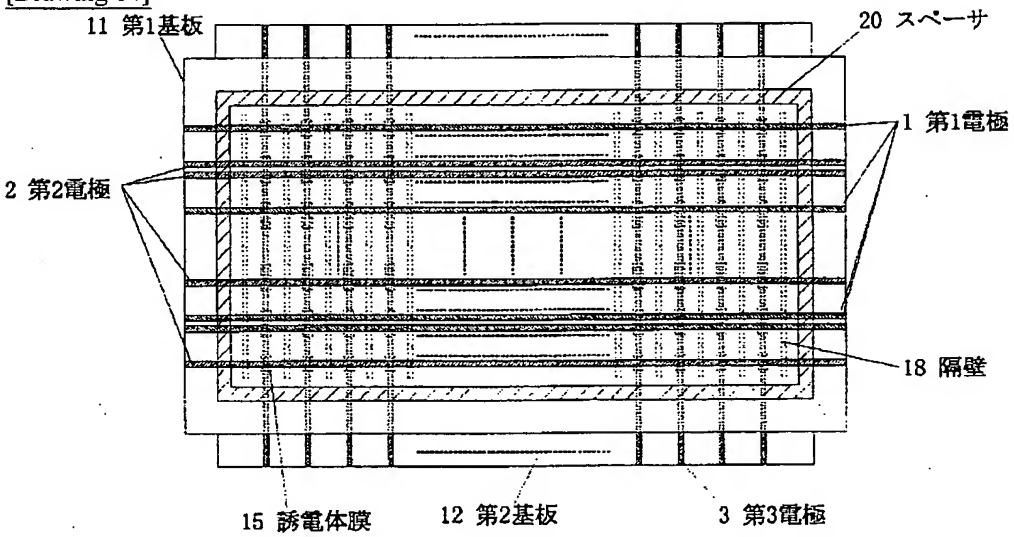
[Drawing 12]



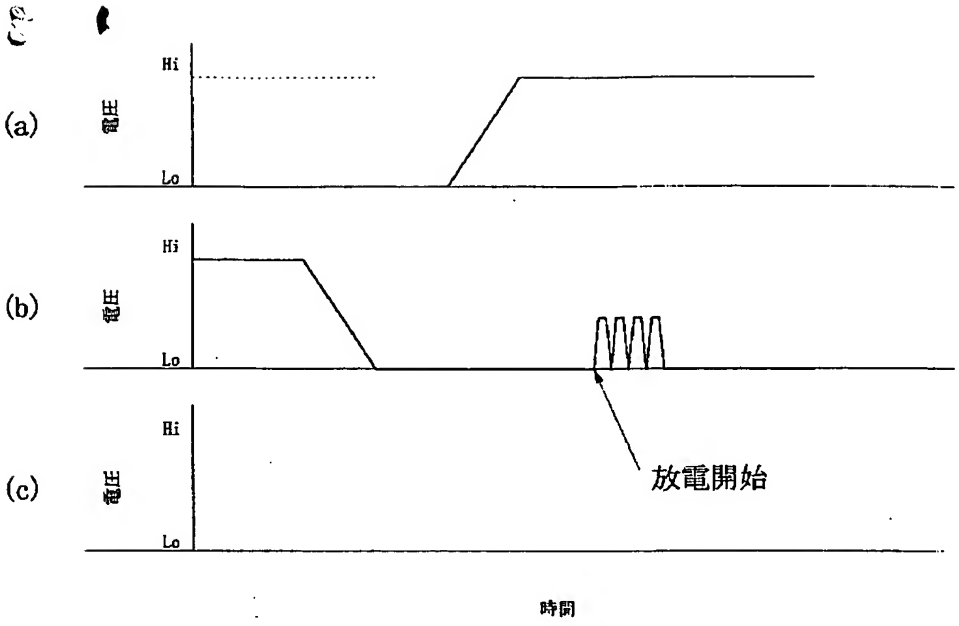
[Drawing 13]



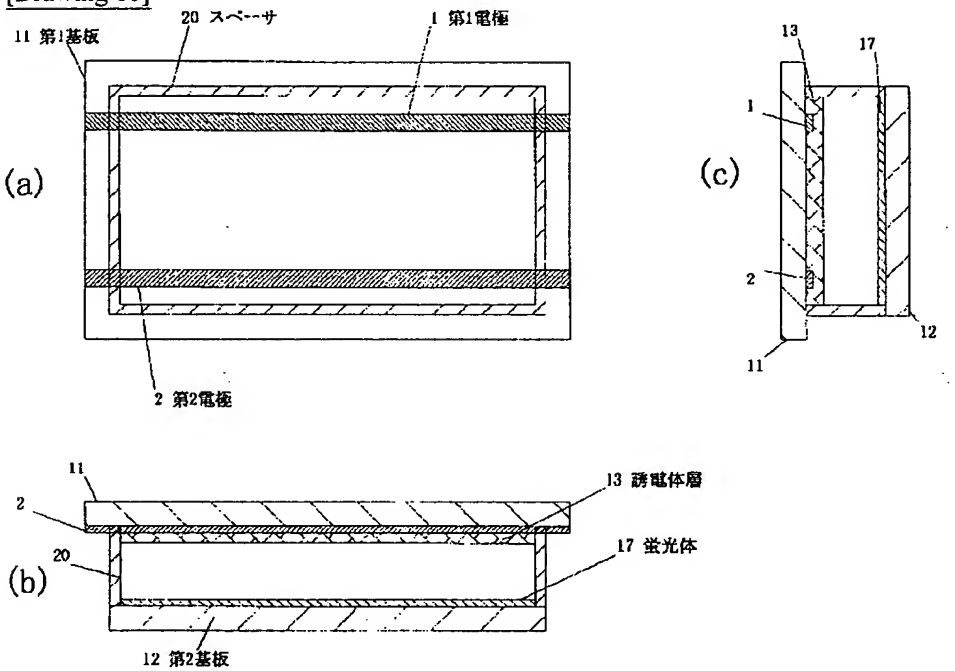
[Drawing 14]



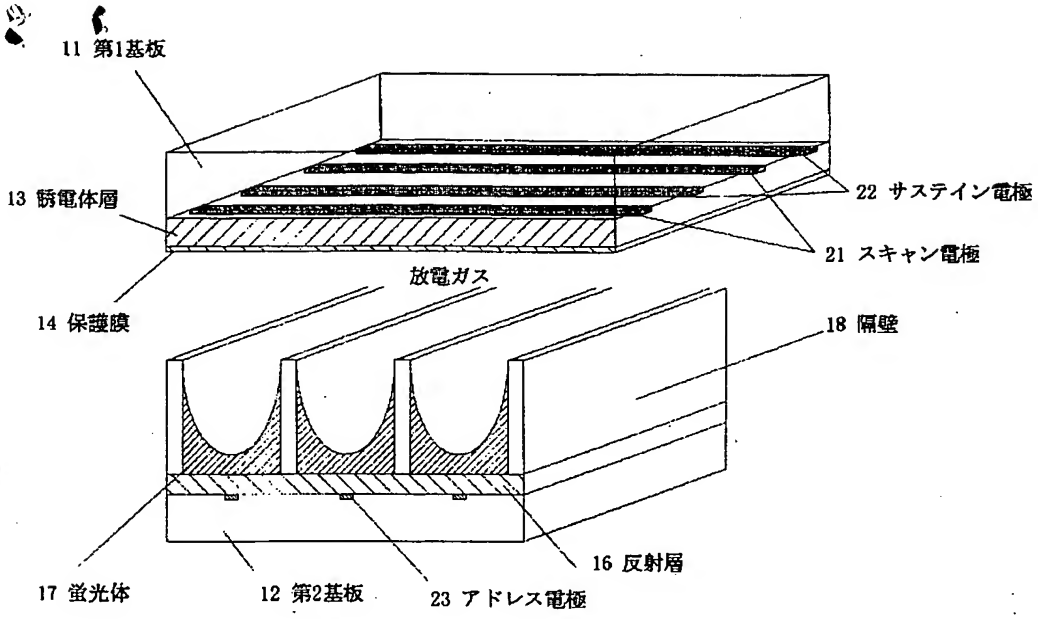
[Drawing 15]



[Drawing 16]



[Drawing 17]



[Translation done.]